

IN THE CLAIMS

1. (withdrawn) A spinal fixation system for implant of elongate support means medially of the spine in place of removed portions of spinous processes, said system comprising:

a plurality of pedicle screws spaced apart in two columns for fixation in bone on both sides of the spine;

a longitudinal support extending along a path between said columns;

a first set of arms having proximal ends hinged to said screws in one of said columns, and having distal ends;

a second set of arms having proximal ends hinged to said screws in the other of said columns, and having distal ends;

a first set of connectors attached to said distal ends of said arms of said first set and to said longitudinal support;

a second set of connectors attached to said distal ends of said arms of said second set and to said longitudinal support; and

means on said screws and said connectors for locking said proximal ends to said screws and for locking said connectors to said longitudinal support.

2. (withdrawn) The system of claim 1 and wherein:

said connectors are rotatably attached to said distal ends.

3. (withdrawn) The system of claim 1 and wherein:

said connectors are rings and said longitudinal support is received through said rings.

4. (withdrawn) The apparatus of claim 3 and wherein:

said means for locking include means for locking said rings to said support.

5. (withdrawn) The system of claim 1 and wherein:

said pedicle screws have heads with slots therein, the system further comprising:

pivot pins received in and extending through the proximal ends of said arms and across said slots and into said screw heads and pivotally mounting said arms to said screw heads; and

said means for locking said proximal ends comprise locking screws in said arms and engaging said pins to lock said arms to said pins, said pins being rotatable in said screw heads.

6. (withdrawn) The system of claim 5 and wherein:

said connectors are rings rotatably connected to said distal ends; and

said means for locking said connectors comprise locking screws fixing said rings to said longitudinal support.

7. (withdrawn) The system of claim 6 and wherein:

the longitudinal support is a spinal rod.

8. (original) A spinal fixation system for implant of elongate support means medially of the spine in place of removed portions of spinous processes and comprising:

a plurality of pedicle screws spaced apart in two columns for fixation in bone on both sides of the spine;

a longitudinal support extending along a path between said columns;

cross supports, each said cross support having two ends, one of said ends being attached to one of said pedicle screws in the one of said columns and the other of said ends being attached to one of said pedicle screws in the other of said columns; and

a mounting bracket attached midway between said ends to each of said cross supports and connected to said longitudinal support.

9. (original) The system of claim 8 and wherein:

each of said pedicle screws has a multi-axial cross support end receiver locked to one of said ends of each cross support.

10. (original) The system of claim 8 and wherein:

said mounting brackets have yokes receiving said longitudinal support member.

11. (original) The support system of claim 8 and wherein:

the longitudinal support member is a spinal rod.

12. (withdrawn) An articulating spinal fixation system for controlled spinal segmental correction and comprising:

a plurality of bone screws spaced along two paths for anchoring in spinal bone in a first column on one side of the spine and in a second column on the other side of the spine;

a longitudinally extending articulated support assembly extending between said columns, said support assembly including a longitudinally extending rod support having first and second

telescoping portions and a first cross support fixed on said first portion and a second cross support swivel mounted to said second portion;

said first cross support having one end connected to one of said bone screws in said first column and having another end connected to one of said bone screws in said second column; and

said second cross support having one end connected to another bone screw in said first column and said second cross support having another end connected to another bone screw in said second column;

means for locking said first and second portions to prevent telescoping; and

means for locking said second cross support to said second portion to prevent pivoting of said second cross support relative to said second portion;

13. (withdrawn) The fixation system of claim 12 and further comprising:

additional longitudinally extending articulated support assemblies connected in series with the first-mentioned longitudinally extending articulated support assembly, and extending longitudinally with and between said columns, for enabling distraction and compression and rotation of spinal segments in a series.

14. (withdrawn) A spinal fixation system comprising:

a plurality of fasteners spaced along two paths for anchoring in spinal bone in a first column on one side of the spine and in a second column on the other side of the spine;

a longitudinal support for extending along the spine in cavities left by removal of spinous process material;

a plurality of cross supports longitudinally spaced on and connected to said longitudinal support and connected to the said fasteners;

swivel joints at spaced locations on said longitudinal support and connecting selected ones of said cross supports to said longitudinal support;

means for locking said swivel joints to fix said cross supports in various orientations relative to said longitudinal support;

sliding joints at selected locations on said longitudinal support and enabling change of spacing between certain ones of said cross supports; and

means on said longitudinal support for locking said sliding joints to fix spacing between said certain ones of said cross supports.

15. (withdrawn) The system of claim 14 and wherein:

said longitudinal support has two interfitting portions at each of the said sliding joints, one of said cross supports being connected to one of said interfitting portions;

another of said cross supports being connected to another of said interfitting portions;

said one and said another of said interfitting portions having colinear axes and being rotatable relative to each other about said colinear axes, whereby said one of said cross supports connected to said one of the interfitting portions is rotatable relative to said another of said cross supports connected to said another of said interfitting portions.

16-34. (cancelled)

35. (withdrawn) A spinal fixation system comprising:

a plurality of pedicle screws spaced along two paths for anchoring in spinal bone in a first column on one side of the spine and in a second column on the other side of the spine, said screws having heads;

a longitudinal support for extending along the spine in space vacated by removal of spinous process portions;

a plurality of cross supports longitudinally spaced on and connected to said longitudinal support and connected to the said screws;

swivel joints at spaced locations on said longitudinal support and connecting selected ones of said cross supports to said longitudinal support; and

means for locking said swivel joints to fix said cross supports in various orientations relative to said longitudinal support.

36. (withdrawn) The system of claim 35 and wherein:

said cross supports have ends; and

one end of each cross support is fastened to the head of a screw in the first column and the other end of each cross support is fastened to the head of a screw in the second column.

37. (withdrawn) The system of claim 36 and wherein:

said cross supports have posterior and anterior surfaces; and

portions of said cross supports near said ends are formed to project in directions from posterior to anterior, to extend around spinal facets.

38. (withdrawn) The system of claim 36 and further comprising:

sliding joints at selected locations on said longitudinal support and enabling change of spacing between certain ones of said cross supports; and

means on said longitudinal support for locking said sliding joints to fix spacing between said certain ones of said cross supports.

39. (withdrawn) The system of claim 38 and wherein:

said longitudinal support at said sliding joints comprises telescoping tubing portions.

40. (withdrawn) The system of claim 39 and wherein:

said cross supports are elongate.

41. (new) A spinal fixation system for implant of elongate support means medially of the spine in place of removed portions of spinous processes, said system comprising:

at least four pedicle screws spaced apart in two columns for fixation in bone on both sides of the spine;

at least one mounting piece;

an arm connected at one end to a first of said pedicle screws and to a mounting piece;

an arm connected at one end to a second of said pedicle screws and to a mounting piece;

and

a longitudinal support extending along a path between said columns and connected to said at least one mounting piece,

wherein at least a portion of said arm connected to said first of said pedicle screws and at least a portion of said arm connected to said second of said pedicle screws are at least one of coplanar in a plane substantially non-parallel to said longitudinal support and coaxial.

42. (new) The apparatus of claim 41, wherein said arm connected to said first of said pedicle screws and said arm connected to said second of said pedicle screws are part of a single arm.

43. (new) The apparatus of claim 41, wherein said arm connected to said first of said pedicle screws and said arm connected to said second of said pedicle screws are physically separate from each other.

44. (new) The apparatus of claim 41, further comprising a set screw engaged with said mounting piece along an axis so that no part of said set screw extend beyond said mounting piece in a direction substantially perpendicular to said axis.

45. (new) The apparatus of claim 41, wherein said mounting piece is substantially circular with a hole therethrough for accommodating said longitudinal support.

46. (new) The apparatus of claim 41, wherein said mounting piece is substantially U-shaped with a channel for accommodating said longitudinal support.

47. (new) The apparatus of claim 41, wherein at least two of said pedicle screws have a medialized orientation.

48. (new) The apparatus of claim 41, wherein said longitudinal support is a single piece.

49. (new) The apparatus of claim 41, wherein said longitudinal support is a multi-piece assembly.

50. (new) The apparatus of claim 41, wherein said arm connected to said first of said pedicle screws and said arm connected to said second of said pedicle screws are physically separate from each other, and at least one of said arms is bent to form at least one angle.